Montana Water Quality Atlas

Surface Waters of Montana

Montana is the fourth largest state in the Union with 145,552 square miles of land area. Its population of 902,195 (2000 census) produces a sparse population density of 6.2 persons per square mile. Populations, and population growth, are concentrated in the valleys of the western and southwestern portion of the state. Population increased by 12.9% during the 1990s.

Glaciated plains and northwestern Great Plains ecoregions characterize the eastern portion of the state. These give way to a mountain valley and foothill prairie region along the Rocky Mountain Front and the lower elevations of the Missouri and Yellowstone River headwaters. The western third of the state lies within the middle and northern Rocky Mountain ecoregions.

Montana contains headwater streams of the Clark Fork-Pend Oreille-Columbia, Missouri-Yellowstone-Mississippi, and St. Mary-Saskatchewan-Nelson watersheds. For administrative purposes the Montana Department of Environmental Quality (DEQ) has identified four administrative basins in the state:

- Columbia – all Montana's west-draining waters, including the Clark Fork, Flathead, and Kootenai Rivers.
- Upper Missouri – the Missouri River drainage downstream to the confluence with the Marias River.
- Lower Missouri – the remaining Missouri River drainage in the state, including the Marias, Musselshell and Milk rivers. The Montana headwaters of the St. Mary drainage are also included in this basin.
- Yellowstone – all waters of the Yellowstone River in Montana. Waters of the Little Missouri drainage in Montana are also included.

Efforts to improve the accuracy of the inventory of waters of the United States have been continuing for a number of years. The USGS and EPA, with assistance from other federal and state entities, produced first the River Reach File (RF3) and then, in the last few of years, the National Hydrography Dataset (NHD). The NHD is the source of the stream and lake size estimates used in this report. Because the primary data source used to develop the RF3 and NHD were USGS topographical maps that were produced over a period of decades, the coverage detail and accuracy varies across the state. The consistency and accuracy of the coverage for perennial streams and the larger lakes is excellent, but there is variability with respect to ephemeral and intermittent streams and the small ponds and wetlands. Fortunately, it is the perennial streams and the larger lakes and reservoirs that are the focus of water quality issues and management in the state. Montana's water quality assessment effort concentrates on these larger waterbodies unless specific factors, such as the presence of likely causes of pollution, draws attention to particular intermittent or ephemeral streams or to individual ponds or wetlands.

Table 1 displays size estimates for waters in the four administrative basins. The figures shown for streams, ditches, and canals include all linear waters in the NHD dataset. The size estimates for perennial streams, ditches and canals are relatively solid estimates, while those for intermittent and ephemeral streams are more tenuous. Review of the various dataset editions intended to list all lakes, reservoirs, ponds, and wetlands in the state revealed substantial variation in their waterbody number and total size estimates. For this reason, the size estimates for these waters displayed by the table are based on named waters having an area of at least 5 acres.

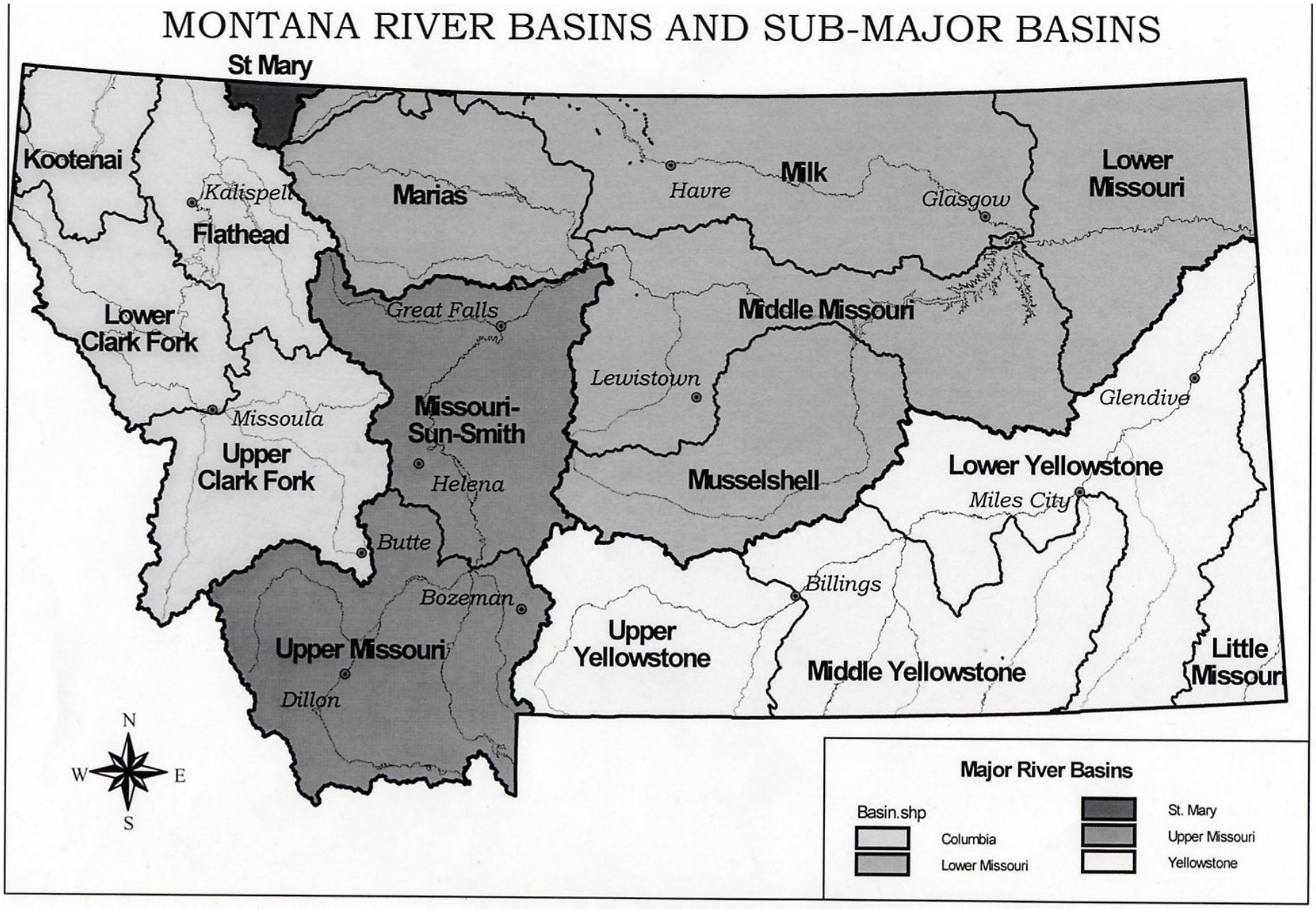
MONTANA RIVER BASINS AND SUB-MAJOR BASINS
St Mary
Kootenai
Kalispell
Flathead
Marias
Havre
Milk
Glasgow
Lower Missouri
Lower Clark Fork
Great Falls
Middle Missouri
Lewistown
Missouri-Sun-Smith
Missoula
Upper Clark Fork
Helena
Musselshell
Glendive
Lower Yellowstone
Miles City
Butte
Billings
Bozeman
Upper Yellowstone
Middle Yellowstone
Little Missouri
Upper Missouri
Dillon
N
W
E
S
Major River Basins
Basin.shp
Columbia
Lower Missouri
St. Mary
Upper Missouri
Yellowstone

Table 1: Montana Surface Waters				
RIVER BASINS	**Perennial Streams** (Miles)	**Intermittent & Ephemeral Streams** (Miles)	**Ditches & Canals** (Miles)	**Lakes, Reservoirs & Wetlands***** (Acres)
Columbia	16,997	12,522	1,002	223,986
Upper Missouri	14,603	17,858	2,504	101,613
Lower Missouri	8,872	47,713	1,637	344,163
Yellowstone	9,171	38,972	1,951	22,064
Montana Total	**49,643**	**117,065**	**7,094**	**691,826**

*** Named Waters at least 5 acres in area.

Size estimates derived from National Hydrography Dataset

The State of Montana's water quality management program does not have authority over all of the waters in Table 1. The US Environmental Protection Agency has assumed responsibility for developing TMDLs for all waters located entirely within Indian Reservations. In addition, waters that are within National Parks and Wilderness Areas are not subject to management activities that are known to deliver pollutants or create conditions that may lead to use support impairments. For that reason, subtracting those waters from the totals listed in Table 1 provides a clearer picture of the waters that the Montana water quality management program has as its primary focus (Table 2). However, with the sole exception of waters on Tribal lands, the Montana water quality management program takes a direct and vested interest in the quality of all waters in the state.

Table 2: State Waters Exclusive of Tribal lands, National Parks, and Wilderness Areas				
RIVER BASINS	**Perennial Streams** (Miles)	**Intermittent & Ephemeral Streams** (Miles)	**Ditches & Canals** (Miles)	**Lakes, Reservoirs & Wetlands***** (Acres)
Columbia	13,389	977	548	193,449
Upper Missouri	13,686	17,532	2,504	100,185
Lower Missouri	6,973	41,999	1,223	318,904
Yellowstone	6,778	35,342	1,812	26,928
Montana Total	**40,825**	**104,646**	**6,088**	**639,466**

*** Named Waters at least 5 acres in area.

Size estimates derived from National Hydrography Dataset

Water Quality Assessment Summary

Assessment Process

The water quality assessment of streams, lakes, and wetlands is an important step in a process intended to ensure that all waterbodies in the state will have water quality adequate to support all of their intended beneficial uses. The process has been developed and shaped by legal mandates, water quality standards, the tools and techniques of water quality monitoring, the availability of information, and the funds and administrative resources that can be devoted to assessment efforts. The process involves several components.

Beneficial-Use Classification

Montana waterbodies are classified according to the present and future beneficial uses that they normally would be capable of supporting. The state Water-Use Classification System (ARM 17.30.604-629) identifies the following beneficial uses:

- Drinking, culinary use, and food processing
- Aquatic life support for fishes and associated aquatic life, waterfowl, and furbearers
- Bathing, swimming, recreation and aesthetics
- Agriculture water supply
- Industrial water supply

The current use classification of each waterbody in Montana was assigned on the basis of its actual or anticipated uses initially in 1955. The system has had modifications over the ensuing years**.** Waterbodies are classified primarily by: 1) the level of protection that they require; 2) the type of fisheries that they support (warm water or cold water) or; 3) their natural ability to support use for drinking water, agriculture etc. Generally cold-water streams are expected to support all of the uses listed above, while many warm-waters located primarily on the eastern plains are naturally not suited for some drinking, agriculture, or industrial uses.

Water Quality Standards

Montana water quality standards include both use-specific components and general provisions. Standards may be either numerical or narrative. The use-specific standards vary depending on the water-use classification, whereas the general provisions apply to all state waters. Narrative standards provide a minimum level of protection to state water and may be used to limit the discharge of pollutants, or the concentration of pollutants in state waters not covered under numerical standards.

Numerical water quality standards relate to:

- Chronic and acute factors affecting aquatic life,
- Human health,
- Fecal coliform levels,
- Changes in pH, turbidity, color, and temperature.

Some standards can be specified in absolute, numerical terms, such as "acute aquatic life standards," or “chronic aquatic life standards” which limit the average concentration of a toxic over a period of time. Many others, however, are defined in terms of change from what would naturally exist, such as "*no increase above naturally occurring condition*" or "*Induced variation of hydrogen ion concentration (pH) within the range of 6.5 to 8.5 must be less than 0.5 pH units.*"

Narrative standards encompass two basic concepts:

- Activities which would result in nuisance aquatic life are prohibited,
- No increases are allowed above naturally occurring conditions of sediment, settleable solids, oils or floating solids, which are harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish or other wildlife.

Identification of Available Water Quality Data

In recent years DEQ's water quality monitoring data along with information from other selected sources have been incorporated into computerized water quality databases. These records and databases provide a basic foundation, which is updated as new monitoring data is collected by DEQ or obtained from others sources. Then, early in each two-year assessment cycle, DEQ sends out requests for information to several hundred individuals, organizations, and agencies involved in water quality monitoring and management. Responses to these requests provide much useful information as well as references to additional materials available from other sources. The data and information obtained from these outside sources are combined with the results obtained from DEQ's ongoing monitoring efforts to provide the basis for water quality assessments.

Sufficient Credible Data (SCD) Assessment

Montana law defines sufficient credible data (SCD) as "*chemical, physical, or biological monitoring data, alone or in combination with narrative information, that supports a finding as to whether a water body is achieving compliance with applicable water quality standards.*" This definition is consistent with a model developed by EPA for assessing the beneficial uses of streams on the basis of a combination of physical (habitat), biological, and chemical monitoring

Montana's sufficient credible data review processes focuses on four components that contribute to data validity and reliability for water quality assessment:

- Technical soundness of methodology
- Spatial/temporal coverage
- Data quality
- Data currency.

In most cases a finding that there is sufficient credible data will result when several types of data have been collected over a period of time using sound technical methods and there are no indications of recent changes that would invalidate previously obtained results.

Beneficial Use-support Determination (BUD)

Once it is ascertained that sufficient credible data are available for a waterbody, the assessment process moves to determine the level of beneficial use support. The degree of support for each beneficial use is rated using four categories:

- Full support
- Partial support
- Non-support
- Threatened

A use is fully supported when all water quality standards applicable to that use are met. When one or more standards are not met due to human activities, the water body is either "not supporting" or "partially supporting" the beneficial use tied to that standard. A use that is currently fully supported but for which observed trends or proposed new sources of pollution indicate a high probability of future impairment may be rated as "threatened." Because the standards for determining use support are different for each use, the

use-support determinations for the various uses of a waterbody are often not the same. Only those beneficial uses that apply to the particular water-use classification of a waterbody are evaluated for that waterbody.

Assessment Status Categorization

Once to beneficial use assessment of a waterbody is complete it is assigned to one of five assessment categories based on the assessment results. The five categories are:

Category 1: Waters for which all applicable beneficial uses have been assessed and all uses have been determined to be fully supported.

Category 2: Waters for which those beneficial uses that have been assessed are fully supported, but some applicable uses have not been assessed.

Category 3: Waters for which there is insufficient data to assess the use support of any applicable beneficial use, so no use support determinations have been made.

Category 4: Waters where one or more beneficial uses have been assessed as being impaired or threatened, however, either all necessary TMDLs have been completed or are not required:

> Subcategory 4A: All TMDLs needed to rectify all identified threats or impairments have been completed and approved.
>
> Subcategory 4B: Waterbodies are on lands where "*other pollution control requirements required by local, State, or Federal authority"* [see 40 CFR 130.7(b)(1)(iii)] are in place, are expected to address all waterbody-pollutant combinations, and attain all water quality standards in a reasonable period of time. These control requirements act "in lieu of" a TMDL, thus no actual TMDLs are required.
>
> Subcategory 4C: Identified threats or impairments result from pollution categories such as dewatering or habitat modification and, thus, the calculation of a Total Maximum Daily Load (TMDL) is not required.

Category 5: Waters where one or more applicable beneficial uses have been assessed as being impaired or threatened, and a TMDL is required to address the factors causing the impairment or threat.

Assessment Results Summary

The interactive database portion of this report provides detailed information about the assessment status of more than 1,000 waters included in the Montana assessment database. For each waterbody the assessment determinations, maps, and the documentation supporting the assessment determinations may be accessed via EnviroNet at http://nris.state.mt.us/wis/environet/. Readers interested in reviewing the status of specific waters should use that section of this report. The tables on the next few pages of this text section of the report provide a statewide summary of the current water quality status of Montana surface waters.

Table 3: 2004 Integrated Report Assessment Categories

Category	Category Description	Streams & Rivers		Lakes, Reservoirs & Wetlands	
		Segments	Miles	Segments	Acres
1	All uses fully supported.	65	199	3	13,503
2	Assessed uses fully supported, but not all uses assessed	103	1,928	7	46,265
3	Insufficient Data to assess any uses	338	7,523	27	56,925
4A	One or more uses impaired but all required TMDLs done	27	493	1	300
4B	No TMDLs required: other pollution control requirements are in place.	0	0	0	0
4C	One or more uses impaired by "pollution" only -- no TMDL needed	105	1,727	2	32,850
5	One or more uses impaired by "pollutants" --TMDL needed	388	7,606	24	456,432
	All Waters in Database*	1,026	19,476	64	606,275

*** Totals reflect only waters in the Assessment Database, NOT all waters in the state.**

Table 4: 2004 Integrated Report Beneficial Use Support Summary

Rivers & Streams

Beneficial Use	Segments Assessed	Miles Assessed	Miles Fully Supporting	Miles Threatened	Miles Partially Supporting	Miles Not Supporting
Aquatic Life Support	570	10,794.2	2,409.7	0.0	6,409.1	1,975.4
Cold Water Fishery	496	7,472.0	1,197.4	8.1	4,294.2	1,972.3
Warm Water Fishery	84	3,790.1	1,179.8	0.0	2,470.5	139.8
Primary Contact (Recr)	497	8,842.4	5,031.6	135.9	3,116.7	558.2
Drinking Water Supply	395	7,189.2	4,376.1	0.0	248.6	2,564.5
Agriculture Supply	534	9,538.4	866.7	0.0	774.0	100.7
Industrial Supply	541	9,527.2	8,584.7	0.0	774.8	167.7

Lakes, Reservoirs & Wetlands

Beneficial Use	Segments Assessed	Acres Assessed	Acres Fully Supporting	Acres Threatened	Acres Partially Supporting	Acres Not Supporting
Aquatic Life Support	37	287,683.3	85,380.9	7,549.9	188,019.4	6,733.1
Cold Water Fishery	23	254,177.6	202,947.8	7,549.9	36,708.8	6,971.1
Warm Water Fishery	11	34,389.4	17,007.7	0.0	17,081.7	300.0
Primary Contact (Recr)	29	519,242.3	206,277.8	0.0	274,452.4	38,512.1
Drinking Water Supply	26	478,427.1	175,374.3	0.0	953.0	302,099.8
Agriculture Supply	30	290,671.9	237,999.9	0.0	48,753.0	3,919.0
Industrial Supply	29	294,776.6	287,079.6	0.0	3,778.0	3,919.0

Table 5: 2004 Integrated Report Causes of Impairment

Cause/Sub-Cause Category	Streams and Rivers				Lakes, Reservoirs, & Wetlands			
	Segments Impaired	% of Tot. Impaired Segments	Miles Impaired	% of Tot. Impaired Miles	Water-bodies Impaired	% of Tot. Impaired Waterbodies	Acres Impaired	% of Tot. Impaired Acres
Pesticides					1	3.7%	3,800	0.8%
Priority organics	2	0.4%	45	0.5%				
PCB's	5	1.0%	72	0.7%	2	7.4%	129,357	26.4%
Metals	183	35.2%	3,421	34.8%	15	55.6%	437,822	89.4%
Arsenic	37	7.1%	392	4.0%	3	11.1%	36,789	7.5%
Cadmium	39	7.5%	479	4.9%				
Copper	58	11.2%	1,128	11.5%				
Chromium	1	0.2%	1	0.0%	1	3.7%	3,781	0.8%
Lead	65	12.5%	1,134	11.5%	2	7.4%	246,600	50.4%
Mercury	43	8.3%	1,236	12.6%	6	22.2%	418,837	85.5%
Selenium	9	1.7%	92	0.9%	5	18.5%	13,575	2.8%
Zinc	41	7.9%	611	6.2%				
Unionized Ammonia	3	0.6%	127	1.3%	1	3.7%	35,180	7.2%
Cyanide	2	0.4%	11	0.1%				
Sulfates	2	0.4%	19	0.2%	2	7.4%	9,100	1.9%
Nutrients	113	21.7%	2,911	29.6%	7	25.9%	178,049	36.4%
Phosphorus	18	3.5%	505	5.1%				
Nitrogen	16	3.1%	244	2.5%	1	3.7%	5,600	1.1%
Nitrate	14	2.7%	277	2.8%				
Other nutrients	1	0.2%	106	1.1%	2	7.4%	3,861	0.8%
pH	14	2.7%	106	1.1%	1	3.7%	20	0.0%
Siltation	216	41.5%	3,743	38.1%	5	18.5%	135,369	27.6%
Organic enrichment/Low DO	6	1.2%	199	2.0%	2	7.4%	129,807	26.5%
Salinity/TDS/chlorides	4	0.8%	96	1.0%	1	3.7%	3,500	0.7%
Salinity/TDS/sulfates	11	2.1%	578	5.9%	5	18.5%	4,872	1.0%
Thermal modifications	54	10.4%	1,458	14.8%				
Flow alteration	204	39.2%	4,249	43.2%	7	25.9%	43,874	9.0%
Dewatering	102	19.6%	1,954	19.9%	1	3.7%	3,781	0.8%
Water level fluctuations					4	14.8%	36,084	7.4%
Other habitat alterations	345	66.3%	6,608	67.3%	4	14.8%	8,465	1.7%
Bank erosion	88	16.9%	1,823	18.6%				
Channel incisement	21	4.0%	339	3.4%				
Riparian degradation	130	25.0%	3,389	34.5%				
Fish habitat degradation	96	18.5%	1,533	15.6%	1	3.7%	3,781	0.8%
Pathogens	14	2.7%	434	4.4%				
Radiation	1	0.2%	81	0.8%				
Oil and grease	1	0.2%	24	0.2%				
Suspended solids	21	4.0%	408	4.2%				
Noxious aquatic plants	2	0.4%	13	0.1%	4	14.8%	289,280	59.1%
Algal Grwth/Chlorophyll a	16	3.1%	381	3.9%	3	11.1%	131,027	26.8%
Total toxics	1	0.2%	8	0.1%				
Turbidity	10	1.9%	108	1.1%				
State Total Impaired*	**520**		**9,826**		**27**		**489,582**	

* These totals are **not a sum** of the columns above. They represent the total number and size of segments impaired by one or more cause, and includes the sum of all Category 4A, 4B, 4C, and 5 waters

Table 6: 2004 Integrated Report Sources of Impairment

Source/Sub-Source Category	Streams and Rivers				Lakes, Reservoirs, & Wetlands			
	Segments Impaired	% of Tot. Impaired Segments	Miles Impaired	% of Tot. Impaired Miles	Water- bodies Impaired	% of Tot. Impaired Waterbodies	Acres Impaired	% of Tot. Impaired Acres
Industrial Point Sources	9	1.7%	187	1.9%				
Municipal Point Sources	14	2.7%	442	4.5%	2	7.4%	161,187	32.9%
Domestic Wastewater Lagoon					1	3.7%	3,500	0.7%
Agriculture	311	59.8%	6,982	71.1%	18	66.7%	315,386	64.4%
Crop-related Sources	113	21.7%	3,369	34.3%	8	29.6%	22,877	4.7%
Grazing related Sources	222	42.7%	5,220	53.1%	3	11.1%	4,852	1.0%
Intensive Animal Feeding Operations	12	2.3%	232	2.4%				
Aquaculture	1	0.2%	2	0.0%				
Silviculture	97	18.7%	1,218	12.4%	5	18.5%	137,357	28.1%
Harvesting, Restoration, Residue Mngt	3	0.6%	61	0.6%				
Forest Management					1	3.7%	3,800	0.8%
Logging Road Construction/Maintenance	43	8.3%	459	4.7%	2	7.4%	6,030	1.2%
Construction	56	10.8%	1,159	11.8%	4	14.8%	38,544	7.9%
Highway/Road/Bridge Construction	38	7.3%	695	7.1%	3	11.1%	3,364	0.7%
Land Development	17	3.3%	448	4.6%	1	3.7%	35,180	7.2%
Urban Runoff/Storm Sewers	8	1.5%	161	1.6%	1	3.7%	126,007	25.7%
Resource Extraction	178	34.2%	2,520	25.6%	7	25.9%	291,090	59.5%
Surface Mining	3	0.6%	8	0.1%				
Subsurface Mining	11	2.1%	102	1.0%				
Placer Mining	15	2.9%	162	1.7%	1	3.7%	5,500	1.1%
Dredge Mining	12	2.3%	108	1.1%		0.0%		
Petroleum Activities					1	3.7%	9	0.0%
Mill Tailings	21	4.0%	345	3.5%				
Mine Tailings	37	7.1%	390	4.0%				
Acid Mine Drainage	57	11.0%	710	7.2%	3	11.1%	40,561	8.3%
Abandoned mining	130	25.0%	1,787	18.2%	6	22.2%	291,081	59.5%
Inactive mining	1	0.2%	38	0.4%				
Land Disposal	11	2.1%	123	1.3%	1	3.7%	35,180	7.2%
Wastewater	1	0.2%	15	0.2%				
Onsite Wastewater Systems (Septic Tanks)	1	0.2%	29	0.3%				
Hydromodification	166	31.9%	4,211	42.9%	9	33.3%	175,739	35.9%
Channelization	58	11.2%	1,366	13.9%				
Dredging	2	0.4%	22	0.2%				
Dam Construction	15	2.9%	544	5.5%				
Upstream Impoundment	7	1.3%	233	2.4%	1	3.7%	126,007	25.7%
Flow Regulation/Modification	87	16.7%	2,276	23.2%	7	25.9%	143,389	29.3%
Bridge Construction	9	1.7%	181	1.8%				
Habitat Modification (other than Hydromod.)	114	21.9%	2,579	26.2%	1	3.7%	3,781	0.8%
Removal of Riparian Vegetation	49	9.4%	1,290	13.1%				
Bank or Shore Modification/Destabilization	58	11.2%	1,296	13.2%				
Erosion from derelict land	1	0.2%	11	0.1%				
Atmospheric Deposition	4	0.8%	58	0.6%	3	11.1%	376,507	76.9%
Highway Maintenance and Runoff	41	7.9%	502	5.1%				
Unpaved Road Runoff	15	2.9%	128	1.3%				
Spills	1	0.2%	26	0.3%				
Contaminated Sediments	21	4.0%	234	2.4%				
Debris and bottom deposits	1	0.2%	1	0.0%	2	7.4%	250,500	51.2%
Internal nutrient cycling (lakes)					1	3.7%	35,180	7.2%
Sediment resuspension	2	0.4%	48	0.5%				
Recreation/Tourism Activities	1	0.2%	12	0.1%				
Groundwater Loadings	1	0.2%	37	0.4%				
Other	4	0.8%	57	0.6%				
Source Unknown	18	3.5%	379	3.9%	4	14.8%	138,657	28.3%
State Total Impaired*	**520**		**9,826**		**27**		**489,582**	

* These totals are **not a sum** of the columns above. They represent the total number and size of segments impaired by one or more cause, and includes the sum of all Category 4A, 4B, 4C, and 5 waters